

ThermoPlate[®]

Microscope-Stage Automatic Thermocontrol System

TPX series

Instruction Manual

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1. For safe and comfortable use

About symbols

These warnings enable safe and correct usage, and prevent dangerous situations. Please follow them at all times.

● Symbol meanings

	Injury or damage to equipment is possible
	Must not be done
	Must be done
	Electric shock is possible

To all users

For Research use only. This device is to be used by researchers doing cultivation observations in a laboratory. It cannot be used at home.

It is important to read the Instruction Manual before using this device. If device is used in manner other than specified in Instruction Manual, safety cannot be assured and may result in damage to device which will not be covered under warranty. Please follow the instructions.

Handling each part with care

Please treat this precision instrument with care.
(Impacting it is forbidden)

Do not put any heavy things on the box.

Do not turn the box upside down.



Do not let the unit moisten.

Regarding the environment for usage and storage

Do not use the device in the below conditions.

Flammable or corrosive gas or oil mist that can damage electrical insulation.

Intense vibration or impact

High voltage power lines, inductive interference
--

Dust, dew drops are present

Places where things can fall down or direct exposure to sunlight.

Points to pay attention when installing to a microscope

- ❗ Use only the specified electricity and cables. If other cables are used this might result in electric shocks. Using a non-specified voltage might result in equipment damage.
- ❗ In case of glass breakage, do not touch the glass. It might result in injury and electric shock.
- ❗ When revolving the objectives turn the aiming handle and let the objective retreat from heating plate. If the objective hits the ThermoPlate and it might result in damage for both.
- ❗ ⚡ Do not handle the device with wet hands. It might cause damage to electric equipment.
- ❗ Please observe the below in order to avoid focus drift during long-term microscope observations.

Keep the room temperature at $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$.
Do not let air flow directly over the device.

- ❗ ⚡ In an emergency pull out the plug from the outlet. Do not place any things near the outlet.

Storage

- ❗ ⚡ While performing maintenance, turn off power supply.

Clean device with soft cloth using small amount of diluted neutral detergent. Do not use organic solvents.









Do not wash the device with water.

Do not use volatile materials such as benzene or thinner for cleaning. Use of such materials will discolor and/or damage key device surfaces.

Do not take the device apart. This results in damage.

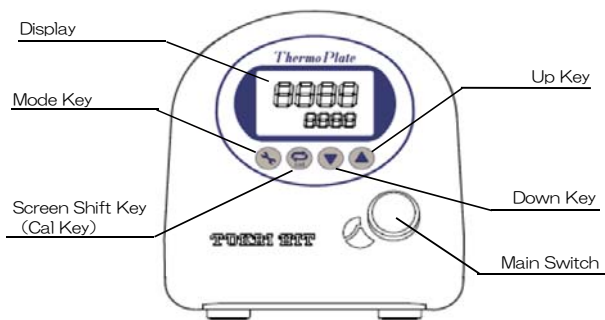
2. Structure



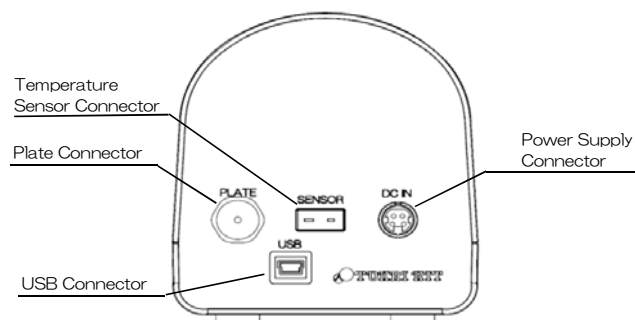
Component name	Q'ty	Part picture
Controller	1	
Heating Plate (with orange line)	1	
Extension wire	1	
Temperature Sensor	1	
AC Adapter	1	
Power Cord	1	
TEM Install CD	1	
USB cable	1	

Controller

① Name of Front Panel



② Name of Rear Panel

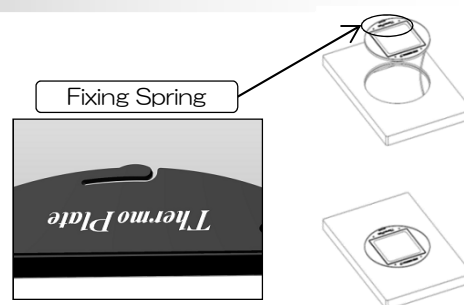
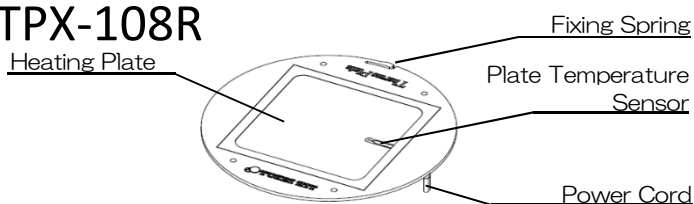


2. Structure (Plate Unit)



TPX-110R

TPX-108R

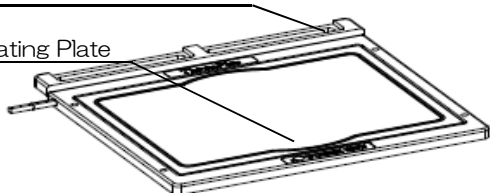


Pass the plate cord through the round stage opening and place the plate to uneven stage opening part by pressing the Fixing Spring inside stage opening.

TPX-S

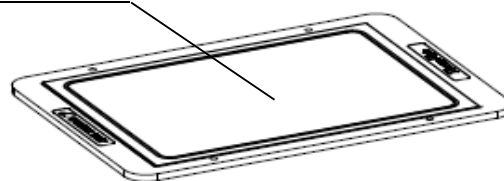
Installation Plate

Heating Plate



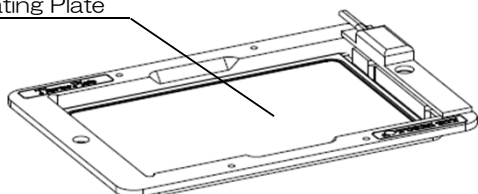
TPX-SQFT

Heating Plate



TPX-SQ

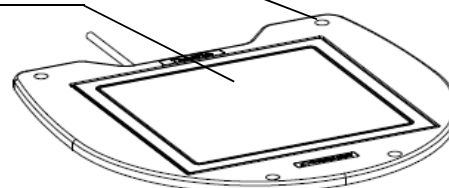
Heating Plate



TPX-SZX2A

Heating Plate

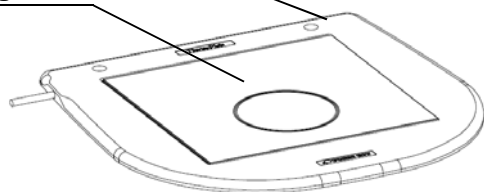
Counterbore for installation screw
(Use screws included in box)



TPX-SMZ25

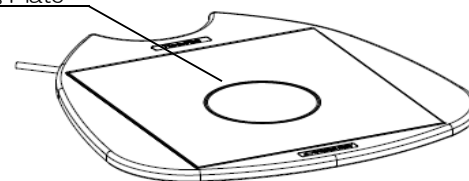
Heating Plate

Counterbore for installation screw
(Use screws included in box)



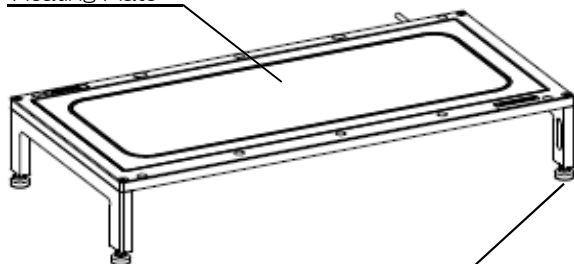
TPX-SMZSL

Heating Plate



TPX-UNI

Heating Plate

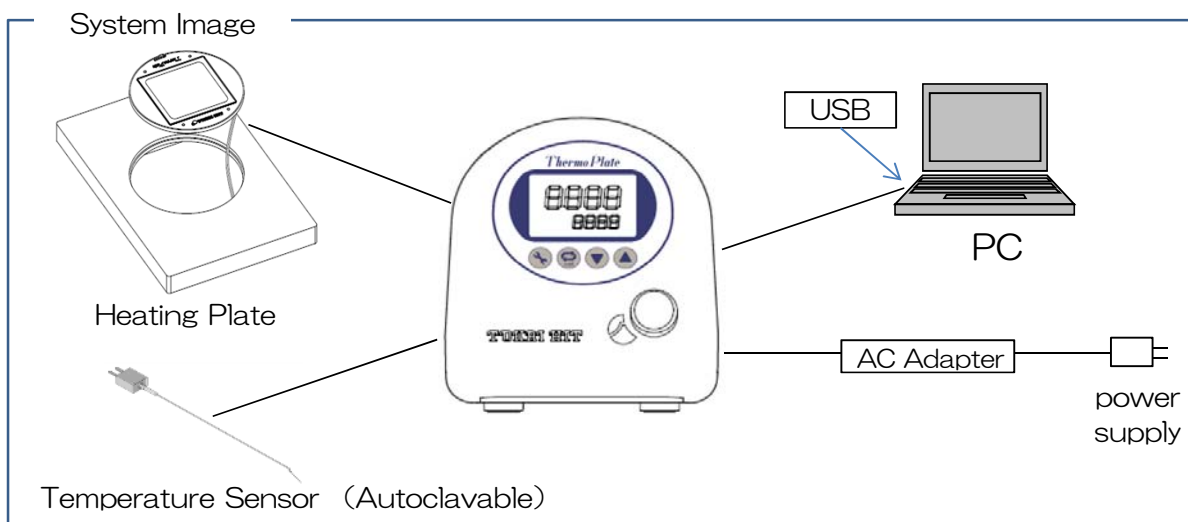


Height adjustable leg
(Adjust the screw for height adjustment)

3. Operation Procedure



- ① Install the Heating Plate on Microscope stage.
Please refer to “2. Structure: Plate Installation” for installation procedure.
- ② Plug the power supply cord in to primary outlet (110-240V).
- ③ Connect AC Adapter with power supply cord.
- ④ Connect AC Adapter with Controller.
- ⑤ Connect power cable between Heating Plate and the Control Unit.
- ⑥ In the case of using Temperature Sensor, connect Temperature Sensor with Extension wire and plug Extension wire connect to Controller.
- ⑦ In the case of using Temperature Control/Management Software “TEM” , connect USB cable between Controller and PC.
- ⑧ Turn on the power switch.
- ⑨ Input SV(Setting Value). (*SV : Plate Setting temperature Value)
Please refer to “4. How to operate” for display indication and key operation.
- ⑩ Wait 10 minutes until Heating Plate temperature becomes stable.
- ⑪ If the Heating Plate temperature does not become stable at one’s actual lab, carry out calibration as needed.
- For manual setting: refer to “5. Thermal Correction (manual)” ;
- For setting via TEM: refer to “8. Thermal Correction (via TEM)” .
- ⑫ Set a dish on the Heating Plate and start observation.
- ⑬ Turn off the power switch and disconnect the plug of power supply cord.



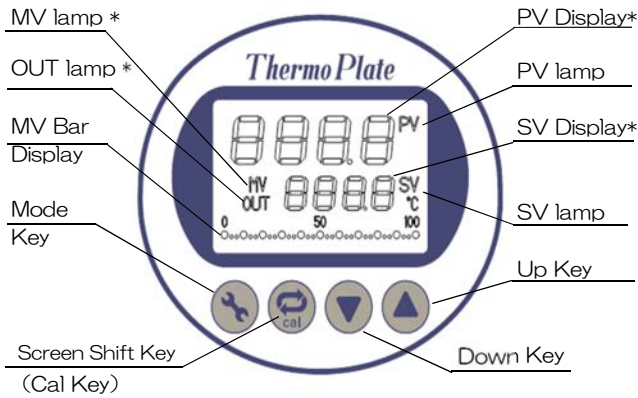
(Caution)

- Please make sure that Serial Number on both Controller (found on the back of the controller) and Glass Heating Plate (found around connector) are IDENTICAL.
- DO NOT use a Controller and Heating Plate with DIFFERENT Serial Numbers.
- Please DO NOT place metal such as specimen holder on top of temperature sensor built in Glass Heating Plate.
- If the above instructions are disregarded, the Proper temperature cannot be obtained on the Heating Plate surface and cause damages.
- When selecting a site for using the device, avoid the places where the plate surface get the air directly from the air-conditionnere for it may cause the plate surface being unevenly-heated.

4. How to Operate



① Display and Key Operation



Display

MV lamp	Lighting in the MV Indication Screen.
PUT lamp	Lighting during electricity is provided from Control Unit to Plate.
MV Bar Display	Indication bar shows Current MV from 0 to 100%.
PV Display	Process Value is indicated in Temperature Display Screen. Itemized value is also displayed during selectable option windows.
PV lamp	Lighting during the plate surface temperature is indicated. Flashing during external sensor temperature is displayed.
SV Display	Setting Value is indicated in the Temperature Display Screen. Itemized value is also displayed during selectable option windows.
SV lamp	Lighting during Setting Value is indicated.

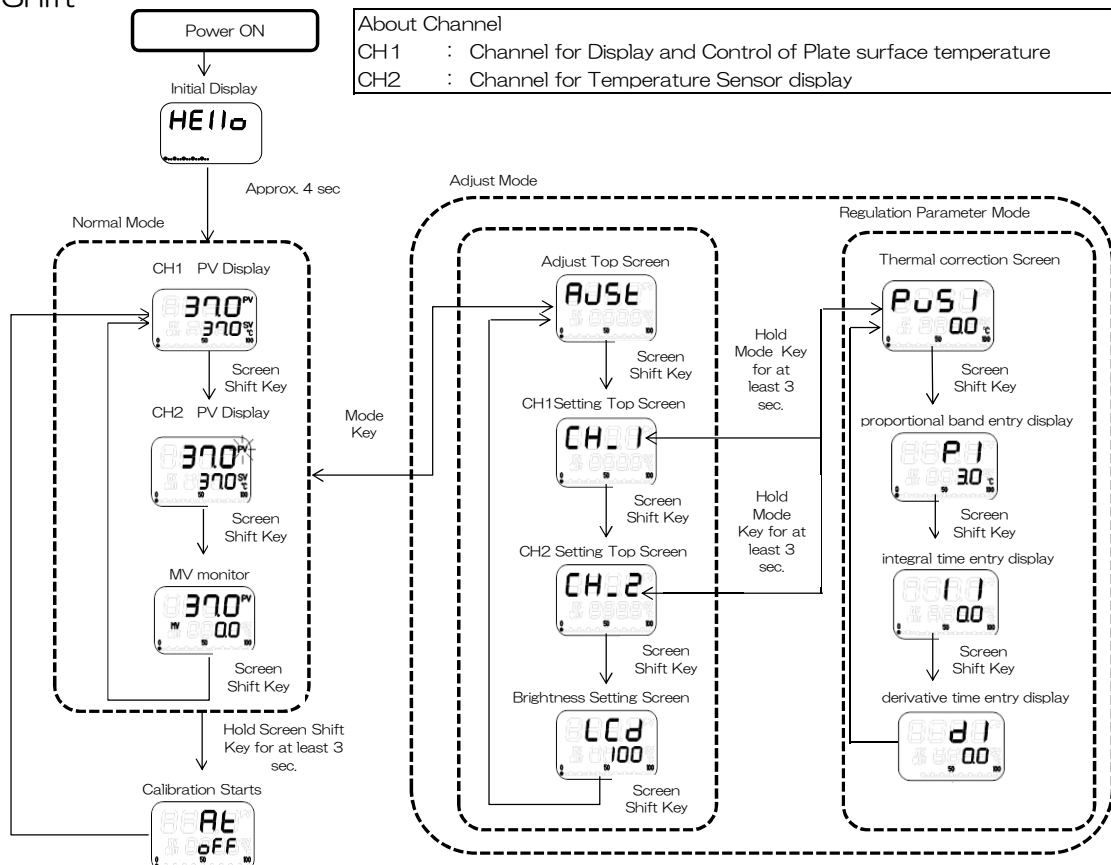
Key Operation

Mode Key	Switchs Normal Mode and Adjust Mode. (*)
Screen Shift Key	1) Shift the screen. 2) Starts Auto-tuning by pressing and holding the button at Normal Mode.
Down Key	Turns down Setting Value.
Up Key	Turns up Setting Value.

* The detail of display words.

PV Display	Process Value Measured value by temperature sensor.
SV Display	Setting Value Setting temperature for plate surface temperature.
MV Monitor	Manipulative Value Indicates amount of output current to heater on percentage.
Normal Mode	Mode for PV/SV/MV indication or PV/SV input.
Adjust Mode	Mode for temperature corrected value, screen brightness, controlled parameter by manual input.

② Screen Shift



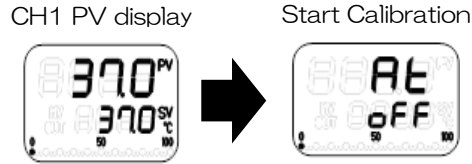
5. Thermal Correction (manual)



1 Calibration

- The system is controlled by PID regulation to maintain stable temperature. When the plate temperature is not stable, carry out calibration to determine the suitable PID. Tokai Hit calibrates the system under room temperature of 25 degreeC +/- 2 degreeC prior to shipment.

- 1) Display Normal Mode.
- 2) Press and hold the Screen Shift Key for at least 3 seconds.
- 3) It starts calibration (Auto-Tuning).
- 4) The Display returns to Normal Mode after calibration (Auto-Tuning) finishes properly its running.



Hold Screen Shift Key for at least 3

2 Input control Parameter by manually *1

CH1 PV display

* 1: enables to change PID values and shift the thermal correction of Heating Plate Sensor and Temperature Sensor.



Mode Key

Adjust Top Screen



CH1 Setting



Screen Shift Key

Press and hold the **Mode Key** for at least 3 seconds.

Thermal correction Screen



setting range
-10~+10°C

proportional band entry display



setting range
0.1~100.0°C

Integral time entry display



setting range
0.0~999.9°C

derivative time entry display



setting range
0.0~999.9°C

PID Input

- The suitable parameter can be achieved by calibration (Auto-Tuning), and also the requirement parameter can be set manually.

- 1) Display Adjust Top Screen by pressing Mode key at Normal Mode.
- 2) Display CH1 Setting Top Screen by pressing Screen Shift Key.
- 3) Press and hold the Mode Key for at least 3 seconds. Press Screen Shift key to change the setting display as follows.
P = proportional band I = integral time D = derivative time
- 4) Press Up key and Down key to set the values.

※ To return Normal Mode : 1. Press and hold the Mode Key for at least 3 seconds. => 2. Select "AJST" display by pressing Screen Shift Key. => 3. Press Mode Key to return Normal Mode.

Temperature sensor correction

- Enables to correct the setting value of Plate temperature sensor and external temperature sensor.

- 1) Display Adjust Top Screen by pressing Mode key at Normal Mode.
- 2) Display CH1 Setting Top Screen by pressing Screen Shift Key.
- 3) Press and hold the Mode Key for at least 3 seconds and it displays PuSI Screen(Thermal correction screen).
- 4) By pressing Up key and Down key for correction. Setting range is -10°C~+10°C.

※Correction will be done by input value which will be added on ProcessValue.

※Follow the same procedure by pressing Screen Shift Key once on above display to adjust CH2 (external temperature sensor).

※To return Normal Mode : 1. Press and hold the Mode Key for at least 3 seconds. => 2. Select "AJST" display by pressing Screen Shift Key. => 3. Press Mode Key to return Normal Mode.

6. TEM -Installation-



Connect & Install software

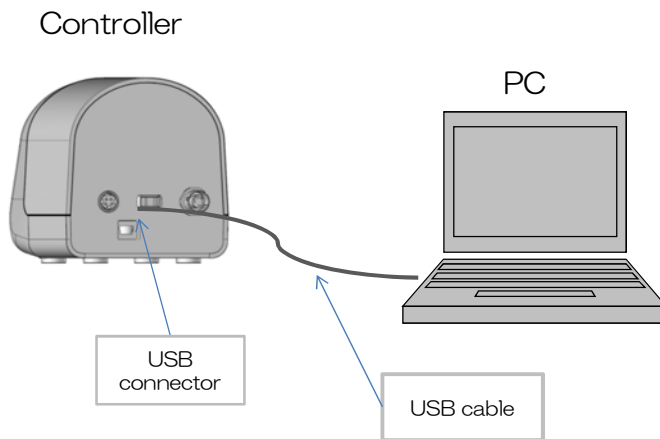
TEM works with Control Unit.
TEM enables to change the device setting and plot the present readout when the controller is connected to a PC.
Furthermore, it has calibration and thermal correction function.



(1) Supported OS

- Windows 7
- Windows Vista
- Windows XP

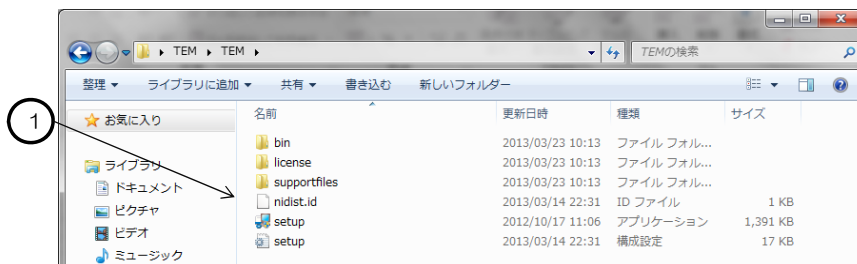
System image:



Connect Controller and PC with USB cable which is included in the package.

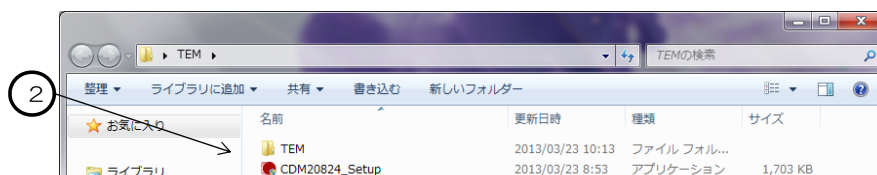
(2) Installation

- 1 Insert the installation CD into PC drive.
- 2 Open TEM folder in the CD and install **setup.exe**.



- 3 Proceed according to installation instructions.

💡 When using Windows Vista, Windows XP or COM port is not recognized on your PC, please install **CDM20824_Setup**(USB driver).



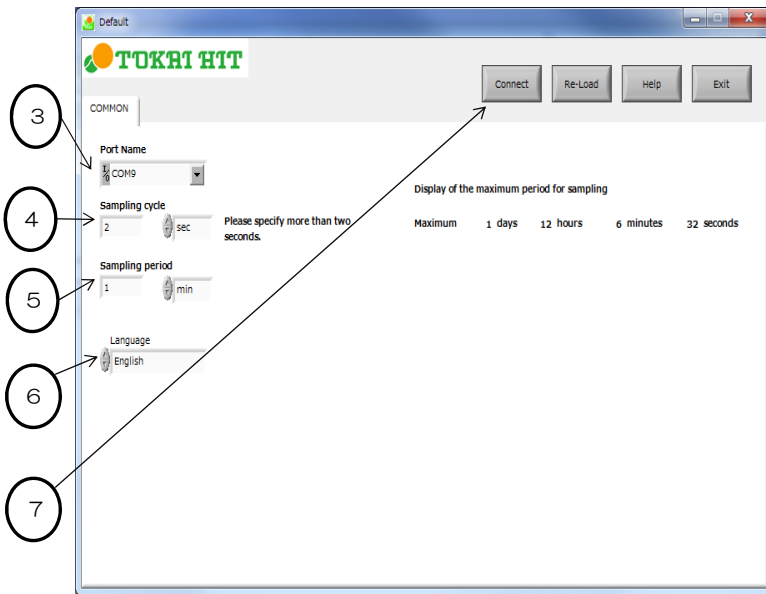
7. TEM -Initial Setting-



Start & Setting

TEM enables to:

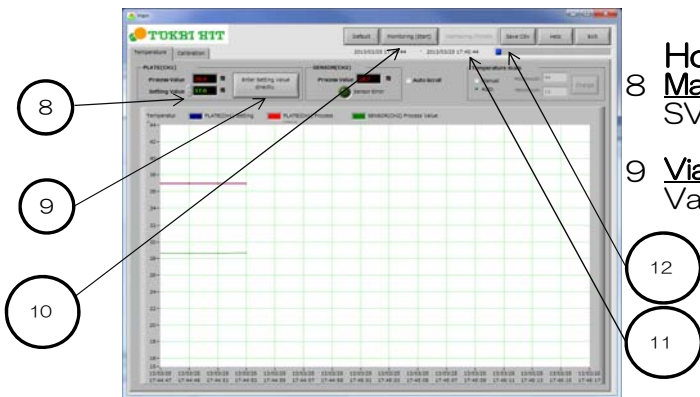
- 1) change the controller setting value
- 2) record set and actual temperature data of Heating Plate: Plate (CH1) over time
- 3) record actual temperature data of external sensor(CH2) temperature over time.



- 1 Switch on the control Unit and run TEM.
- 2 TEM will start and display as Left image.

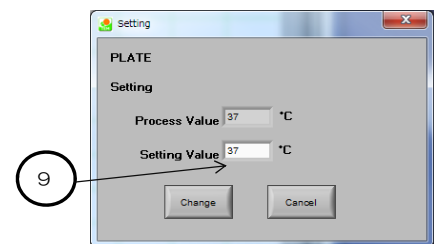
- 3 Select Port Name.
- ☛ Confirm the port names using the device manager.

- 4 Sampling cycle sets the data acquisition cycle.
- 5 Sampling period sets the data acquisition period.
- 6 Language sets the language for the indication. Choose from Japanese, Chinese, English.
- 7 Press the Connect button to move to main window.



How to set Heating Plate SV :

- 8 **Manual:** press Controller up/down key to change the SV.
- 9 **Via TEM:** at main window, press ⑨Enter Setting Value directly and input the Setting Value.



Time and interval during data gathering

The sampling cycle and sampling period at the beginning of the TEM session will be directly applied.

- 10 Press the ⑩Monitoring(Start) button to start

- ❗ During the recording, the following functions are disabled until pressing Monitoring(Finish).
 - > Click Exit button
 - >> All functions within the calibration tab
 - >> Saving CSV files
 - >> Initial settings

- 11 Press Monitoring(Finish) to end the recording.

- 12 Press Save CSV to save a CSV file containing all recorded data from the time Monitoring(Start) is pressed until Monitoring(Finish) is pressed.

☛ The saved file can then be opened in Excel(MS) or other spreadsheets.

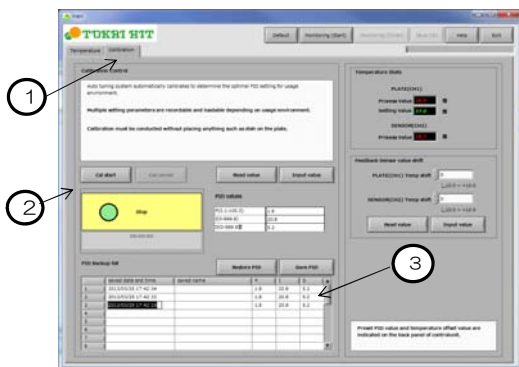
8. Thermal Correction via TEM



Calibration

- Calibration enables to determine the optimal temperature control setting (PID setting) in one's laboratory. When installing ThermoPlate: Plate(CH1) or changing the lab condition, control of Heating Plate: Plate(CH1) can be optimized. Controller is calibrated to 25(+/-2) degreeC environment prior to its shipment.

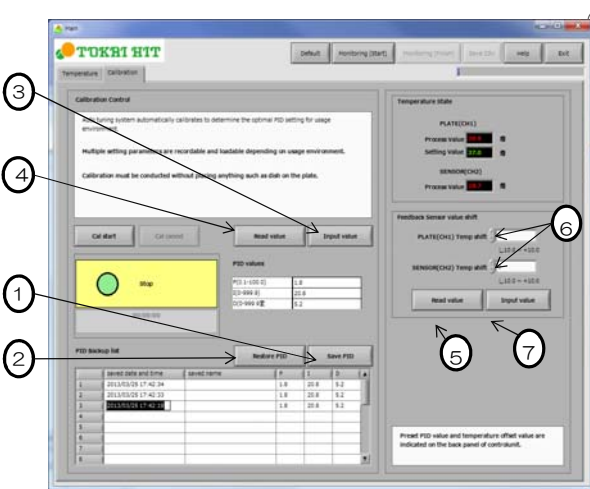
- ① Choose the main window Calibration tab.
- ② Press the CAL START button for calibration. The monitor "Stop" changes to "Run". The parameters for the PID temperature control are automatically obtained. This procedure takes several minutes.



- ③ After this procedure, this PID values will be displayed, sent to the controller, and used for heating control.

Saving and sending the acquired parameter to the Control Unit

It is possible to back up and re-read parameter data.



- ① Save PID values. Press **Save PID** button. The values are displayed.
- ② Read saved PID values. Choose from the *PID Backup list* and press **Restore PID** button. The values will be displayed on PID values.
- ③ Send PID values to Controller. Press the **Input Value** button to send the PID values to the Controller. .
- ④ The PID values are taken from the controller and the displayed when **Read Value** button is pressed.

Temperature Sensor thermal correction

It is possible to thermal correct the shown Heating Plate: Plate(CH1) and external sensor(CH2) temperature.

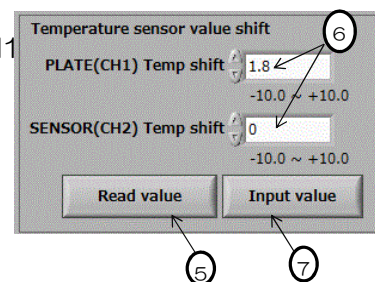
- ⑤ Press **Read Value** button and current PID values are displayed on PID values.



The current temperature Sensor Shift Values are displayed.

- ⑥ Add the difference between the Present Value and the actual temperature to the temperature sensor value shift.

- ⑦ Press **Input Value** button to send the new shift value to the controller. In the case there is a difference between the actual temperature and PV, go back to step ⑤.



9. Trouble Shooting



Following error may be appeared.

Confirm the error indication on the monitor when the system is not working properly.

Display	Cause	Remedy
Err0	Malfunction of memory IC	Unplug and plug the power supply cord. If the device still does not work properly, please contact distributor or Tokai Hit.
Err1	Malfunction of temperature converter circuit	
Err2	Unable to carry out calibration	Press Mode Key. Confirm there are not any objective placed on the Heating plate surface, then start calibration (Auto-tuning) again. If the device still does not work properly, please contact distributor or Tokai Hit.
HErr	Plate temperature does not raise.	Press Mode Key. Confirm if the room temperature is 25 degreeC +/- 2 degree C or if the Setting Value is not too high. Then, if the error is occurred again, please contact distributor or Tokai Hit.
SErr	Heating Plate temperature sensor or external sensor does not read temperature.	Confirm if the power cable is connected to the Controller. If still the temperature is not displayed on the monitor, please contact distributor or Tokai Hit.
-	Monitor is too bright.	Display Brightness setting 1) Display Brightness Setting Screen. (refer 4. How to operate) 2) Press Up key and Down key to adjust its brightness between 0 and 100. 3) Default brightness value is 100.

Please refer to the following for the other case of not working properly.

PV is not correct.	Do thermal correction.
CH1 PV is unstable.	Carry out calibration (Auto-tuning).

In the case of the system is not improved, please contact distributor or Tokai Hit.

10. Specification



Temperature Control	Method	PID Control
	Increments	0.1°C
	Setting method	Digital switch using UP and DOWN key
	Maximum temp. setting	60°C
	Minimum temp. setting	0°C (*Controllable temperature setting is at least 5 degreeC higher than room temperature.)
	Temperature accuracy	Within ±0.3°C at heating plate surface, at plate center
	Sensor	Thermocouple
Power Source	AC100~240V	
Current rating	1.88A	
Maximum Power Consumption	45W	

Power Cord cable

For use in areas with 100V-120V power	Use only Power Supply Cable described below: Detachable cord set, 3-conductor grounding type SVNT No. 18AWG rated at 125V, AC 125V7A minimum, listed in UL. In case of using with extension cord, use only Power Supply Cord with PE (Protective Earth) wire.
For use in areas with 220V - 240V power	Use only 3-pole Power Supply Cable, with plug and outlet complying with EU/EN standards in EU territory. Class 1 equipment must be connected to PE (Protective Earth) terminal. On case of using with extension cord, use only power Supply Cord with PE (Protective Earth) wire.

Use Conditions

Location	Indoor only
Temperature	25°C ±2°C
Relative Humidity	35~80% (no condensation)
Altitude	Up to 2000m maximum
Environment Conditions	Installation category II of IEC60664, Pollution degree 2

Safety

Safety device	Disables over 60°C setting
	Limit on Manipulative Value(MV value) to prevent abnormal heat generation

Warranty Coverage

1. 10 years warranty for glass breakage from the date of shipment.
2. Other repairs except glass breakage are not covered by 10 years warranty.
3. Intentional glass breakage is not covered by warranty.

COMPLIES WITH WEEE DIRECTIVE

Symbol for separate collection applicable in European countries



This symbol designates this product is to be collected separately. The following applies only to users in European countries:

- This product must be disposed of at appropriate site only.
- Do not discard as household refuse.
- For more details, contact distributor or local refuse disposal management authorities.

Symbol für getrennte Wertstoff-/Schadstoffsammlung in europäischen Ländern



Dieses Symbol zeigt an, daß dieses Produkt separat gesammelt werden soll.

Die folgenden wendet nur an Benutzer in den europäischen Ländern.

- Dieses Produkt muß nur separat an einer geeigneten Sammelstelle entsorgen.
- Entsorgen Sie nicht dieses Produkt als Hausmüll.
- Zu mehr Information, setzen Sie sich mit dem Einzelhändler oder mit den lokalen Behörden verantwortlich für Abfallwirtschaft in Verbindung.

Símbolo para la recolección selectiva en Europa



Este símbolo representa que este producto se recogerá por separado en Europa.

Para esta recolección tengase en cuenta que,

- se tiene un lugar de almacenamiento asignado
- no arrojar el producto junto con desechos domésticos y
- puede obtener el información, contactándose con el proveedor o autoridades locales a cargo de la gestión de residuos.

Symbole pour la récupération sélective en Europe



Ce symbole représent que ce produit doit être récupéré séparément en Europe.

Pour cette récupération veuillez prendre note des points suivants.

- Ce produit doit être déposé séparément dans un dépôt approprié.
- Ne pas jetéz ce produit dans une poubelle pour les ordures ménagères.
- Pour obtenir plus de renseignements, contactez le commerçant ou les autorités locales responsables de la gestion des ordures

Memo





306-1 Gendoji-cho, Fujinomiya-shi, Shizuoka-ken, Japan 418-0074
Phone: +81 544 24 6699 Fax: +81 544 24 6641
HP www.tokaihit.com E-mail solution@tokaihit.com